



Oregon

John A. Kitzhaber, MD, Governor

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May 20, 2014

Also Sent Via E-mail

Mr. Robert J. Wyatt
NW Natural
220 N.W. Second Avenue
Portland, OR 97209

**Re: Data Report, Source Control Extraction System, Phase 1 Step 4 Test - Shoreline Segments 1 and 2, NW Natural Property and the Northern Portion of the Siltronic Corporation Property
Portland, Oregon
ECSI Nos. 84 and 183**

Dear Mr. Wyatt:

The Department of Environmental Quality (DEQ) reviewed the "Data Report: Groundwater Source Control Extraction System Test - Phase 1 Step 4 - NW Natural Gasco Site" dated April 10-, 2014 (Phase 1-Step 4 Report). The Phase 1-Step 4 Report presents the results of the Phase 1-Step 4 test of the Alluvium water-bearing zone (WBZ) hydraulic control and containment (HC&C) system. Anchor QEA, LLC (Anchor) prepared the Phase 1-Step 4 Report for NW Natural.

The primary purpose of this letter is to inform NW Natural that based on our review of the report, DEQ:

- Approves Anchor's recommendations in Section 7 of the report to perform a set-point test (i.e., Phase 1-Step 5) that involves pumping the lower Alluvium WBZ extraction wells in the HC&C system for 7-days at a set-point of -0.15-feet; pumping the upper Alluvium WBZ extraction wells at 5-gallons per minute (gpm) except for PW-1U which will be operated at 10 gpm; and moving the control wells in Segment 2 from lower Alluvium WBZ installations to certain upper Alluvium WBZ monitoring wells; and
- Requests NW Natural to provide documentation of the redevelopment work completed before the Phase 1-Step 4 test at extraction wells PW-1U and PW-1L within 14-days of receipt of DEQ's comments.

In addition to DEQ, the U.S. Environmental Protection Agency (EPA) reviewed the Phase 1-Step 4 Report. The DEQ and EPA comment sets are attached as Attachment 1 and Attachment 2 respectively. For clarification, DEQ is not requesting NW Natural to revise and resubmit the Phase 1-Step 4 Report. Except as indicated, DEQ and EPA comments should be addressed in the final Phase 1 testing data summary and analysis report. Before NW Natural begins preparation of the final report, DEQ requests a meeting to discuss the organization and content of the

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Bob Wyatt
NW Natural
May 20, 2014
Page 2 of 2

document. Shared understandings of data presentation and analysis will save time and resources during preparation and review of the final report.

Please contact me with questions regarding this letter or the attachments.

Sincerely,



Dana Bayuk
Project Manager
Northwest Region Cleanup and Site Assessment Section

Attachments: DEQ Comments
EPA Comments

Cc: Myron Burr, Siltronic Corporation
Patty Dost, Pearl Legal Group
Alan Gladstone, Davis Rothwell Earle and Xochihua
John Edwards, Anchor
Ben Hung, Anchor
John Renda, Anchor
Rob Ede, Hahn & Associates
Lance Downs, Advanced Remediation Technologies, Inc.
Terry Driscoll, Aponowich, Driscoll & Associates
Mike Crystal, Severson Environmental Services, Inc.
James Peale, Maul Foster Alongi
Sean Sheldrake, EPA
Rich Muza, EPA
Lance Peterson, CDM Smith
Scott Coffey, CDM Smith
Keith Johnson, NWR/Cleanup and Site Assessment Section
Tom Gainer, NWR/Cleanup and Site Assessment Section
Henning Larsen, NWR/Cleanup & Tanks Section
Rob Burkhardt, NWR/Water Quality Section
ECSI No. 84 File
ECSI No. 183 File

ATTACHMENT 1

DEQ Comments

“Data Report: Groundwater Source Control Extraction System Test

Phase 1 Step 4

NW Natural Gasco Site”

Portland, Oregon

DEQ Comments Sent May 20, 2014

DEQ reviewed the “Data Report: Groundwater Source Control Extraction System Test, Phase 1 Step 4 – NW Natural Gasco Site” dated April 10, 2014 (Phase 1-Step 4 Report). The Phase 1-Step 4 Report presents the results of the Phase 1-Step 4 test of the Alluvium water-bearing zone (WBZ) hydraulic control and containment (HC&C) system. Anchor QEA, LLC prepared the Phase 1-Step 4 Report for NW Natural.

The HC&C system Phase 1 tests completed to date include the following:

- Phase 1-Step 1 – Pump the upper tier of extraction wells located in the portion of shoreline Segment 1 where DNAPL occurs for 24-hours at a set-point of -0.10-feet
- Phase 1-Step 2 – Pump all extraction wells in the HC&C system for 7-days at a set-point of -0.10-feet
- Phase 1-Step 3 – Pump all extraction wells in the HC&C system for 7-days at a set-point of -0.15-feet
- Phase 1-Step 4 – Pump all extraction wells in the HC&C system for 7-days at a set-point of -0.3-feet

The Phase 1-Step 1, Step 2, and Step 3 tests are described in and were performed consistent with Final Test Plan¹. NW Natural recommended the Phase 1-Step 4 test based on the results of these tests.

The Test Summary Report² presents the results of the Phase 1-Step 1, Step 2, and Step 3 tests. DEQ’s January 29, 2014 letter provides DEQ and EPA comments on the Test Summary Report as attachments 1 and 2 respectively. DEQ’s January 29th letter requested the comments to be addressed in the “...next HC&C system test data submittal (e.g., the Phase 1-Step 4 test report).” The results of the Phase 1-Step 4 test indicated to Anchor that additional testing was needed in the Segment 2 portion of the HC&C system. Based on this information Anchor, DEQ, and EPA agreed the Phase 1-Step 4 Report should focus on compiling and describing Phase 1-Step 4 test data and not present a thorough analysis of the results. Consequently the Phase 1-Test 4 Report does not address certain of DEQ’s January 29th comments, including the General Comment and Specific Comments #2, #3, #5, and #7. DEQ considers comments #1, #4, and #6 to be addressed by the Phase 1-Step 4 Report.

¹ Anchor QEA, LLC, 2013, “Final Groundwater Source Control Extraction System Test Plan – NW Natural Gasco Site,” November (received November 13, 2013), a document prepared for NW Natural.

² Anchor QEA, LLC, 2013, “Data Report: Groundwater Source Control Extraction System Test – NW Natural Gasco Site,” December 23, a report prepared for NW Natural.

DEQ's comments on the Phase 1-Step 4 Report are provided below. DEQ's January 29, 2014 General Comment and Specific Comments #2, #3, #5, and #7 are included for completeness and have been revised as appropriate based on our review of the Phase 1-Step 4 Report.

GENERAL COMMENT

Data Evaluations, Report Organization, and Data Collection Objectives

The HC&C system is being tested in two phases that are described in Section 3 of the Final Test Plan. A primary objective of the Phase 1 testing is to select the set-point(s) for the long-term testing phase (i.e., Phase 2). Initiation of Phase 2 testing is dependent on the Phase 1 set-point tests achieving data collection objectives 1 through 6 listed in Section 2.2 of the Final Test Plan. The Test Summary Report and the Phase 1-Step 4 Report compile water level data onto figures that allow the results to be evaluated in terms of the data collection objectives. However, the report does not evaluate and/or discuss the data in the context of the data collection objectives. DEQ acknowledges that the first phase of HC&C system is ongoing and NW Natural is recommending further Phase 1 testing in Segment 2. That said, the basis for moving forward with the long-term Phase 2 test will be a detailed and thorough demonstration of how the data collection objectives have been met by the Phase 1 set-point tests. DEQ anticipates this evaluation will be provided in the final Phase 1 testing data summary and analysis report.

As indicated in DEQ's January 29, 2014 general comment, although individual figures in the Test Summary Report compile data in a usable format for evaluating HC&C testing, the organization of the document did not lend itself to evaluation in terms of the data collection objectives. In general, water level data in the report are organized and presented according to hydrostratigraphic unit and location. This is also the case for the Phase 1-Step 4 Report. Based on DEQ's review of the Test Summary Report and the Phase 1-Step 4 Report, the discussions and data presentations focus on differences in water level elevations between different hydrostratigraphic units and the river and between adjacent hydrostratigraphic units. However, the data collection objectives are based on comparisons of water level elevations between the river and installations in the performance monitoring network based on the design objective (upper Alluvium WBZ installations in the portion of Segment 1 where DNAPL occurs); the installation type (control wells); the hydraulic efficiency of the material in which installations are constructed (minimal, low, or high); and the locations of installations (e.g., installations at the margins of the network, installations in the deep lower Alluvium WBZ). DEQ requests that the final Phase 1 test report organize discussions and data presentations according to the data collection objectives. Prior to beginning preparation of the final Phase 1 report, DEQ requests a meeting to discuss the organization and content of the document in the context of this comment. Shared understandings of data presentation and analysis will save time and resources during preparation and review of the final Phase 1 testing report.

SPECIFIC COMMENTS

1. **Section 2.** The report discusses the flow rates of the HC&C system and extraction wells prior to beginning Phase 1 testing. DEQ requests that the average discharge of the HC&C system, and the average extraction well pumping rates and minimum available drawdown measured

at each extraction well during each Phase 1 test be compiled for the final Phase 1 testing report.

2. **Section 3.3 (January 29th Comment #2 revised).** Figures in the Phase 1-Step 4 Report indicate that many of the installations constructed in the deep lower Alluvium WBZ consistently exhibit water level elevations above the river (e.g., MW-21-165, MW-18-180, PZ6-150), or approximate river levels within the error of water level measurements (e.g., MW-19-180, PZ7-150). DEQ understands based on the outcome of the Phase 1-Step 4 set-point test that NW Natural will be using a gradient analysis approach to assess the influence of the HC&C system on installations in the deep lower Alluvium WBZ. The analysis involves calculating and comparing the hydraulic gradient between the installation and river and the installation and the nearest extraction well. NW Natural and DEQ agree that groundwater in the deep lower Alluvium WBZ will move in the direction of the higher gradient. Details regarding how the gradient analyses will be performed have not been provided to date. DEQ requests that the analyses be fully documented in the final Phase 1 testing report. Documentation should include cross-sections showing the flow paths used in each of the gradient calculations performed. For clarification, discussions of vertical flow paths in Section 3.3 of the Phase 1-Step 4 Report do not meet the needs of the project. Comparison of water level differences between paired wells provides information on the potential relative movement of groundwater between hydrostratigraphic units. The water level comparisons alone do not provide information on groundwater flow path(s).
3. **Section 3.3 (January 29th Comment #3 revised).** As indicated in Comment #2 above, many deep lower Alluvium WBZ installations consistently exhibit water level elevations above the river. That said, during the Phase 1-Step 4 set-point test there are monitoring wells constructed in the deep lower Alluvium WBZ that appear to respond to pumping and whose water level elevations are approximately equal to or lower than the river (MW-5-175, WS-14-161, WS-11-161, WS-12-161). DEQ concludes well construction influences the water levels being recorded in at least two cases. As indicated by Figure 2-3c, the screened intervals for monitoring wells WS-14-161 and WS-11-161 penetrate the deep aquitard. Penetration of the deep aquitard could hydraulically connect the lower Alluvium WBZ with the deep lower Alluvium WBZ and result in an apparent influence on these installations by the HC&C system that would not occur otherwise. Based on our review of the Phase 1-Step 4 Report, DEQ concludes the hydraulic response of WS-11-161 and WS-14-161 is not representative of the deep lower Alluvium WBZ. In other words, these installations are hydraulically connected to the lower Alluvium WBZ above the deep aquitard due to construction. Regarding WS-14-161, due to the appearance of DNAPL in this well Siltronic is preparing an abandonment plan for this installation. DEQ is currently reviewing construction information for WS-11-161. In general, DEQ considers replacement of decommissioned monitoring wells to be warranted if project needs cannot be met by existing installations in the performance monitoring network.
4. **Section 5.** NW Natural recommends further testing (Phase 1-Step 5) of the HC&C system in Segment 2. DEQ's September 22, 2011 comments on the Revised Interim Design Report³ (see comment to "Section 3.2.2.2.1, 2nd paragraph page 30") previously recommended adding an upper Alluvium WBZ extraction well in Segment 2 at the PW-10L location (i.e., PW-

³ Anchor QEA, LLC, 2011, "Draft Groundwater Source Control Final Design Report, NW Natural Gasco Site," May (received May 9, 2011), a report prepared on behalf of NW Natural (recognized by DEQ as the equivalent of the Revised Groundwater Source Control Interim Design Report).

10U). DEQ's August 9, 2013 letter commenting on both the Construction Design Report⁴ and NW Natural's November 4, 2011 responses to our September 22, 2011 comments letter, accepted NW Natural's recommendation to evaluate the need for additional Segment 2 extraction wells (PW-9U and PW-10U) based on the initial operation and testing of the HC&C system (see comment to "Category 1, Comment 19, Section 3.2.2.2.1, 2nd paragraph page 30 [also Category 2, Comment 11]"). Besides evaluating the need for extraction wells PW-9U and PW-10U, DEQ's comment requests the results of the initial operation/testing phase be used to conduct a full review of contingency measures that should be implemented before full-scale full-time operation of the HC&C system proceeds. Consistent with previous comments, DEQ requests that the final Phase 1 testing report include a full review of contingency measures, including adding PW-9U and PW-10U to the HC&C system.

5. **Section 6.1 (January 29th Comment #5 revised).** DEQ's January 29, 2014 letter approved redevelopment of extraction wells PW-1U and PW-1L prior to conducting the Phase 1-Step 4 test. DEQ requested that documentation of the redevelopment work be included in the Phase 1-Step 4 Report. Although the Phase 1-Step 4 Test Report mentions redevelopment work successfully increased the specific capacity of the two wells, documentation of the work is not provided. DEQ requests the documentation be submitted in a separate letter within 14-days of NW Natural's receipt of DEQ's comments. Consistent with previous work done by NW Natural, documentation should include an evaluation of whether and/or how redevelopment achieved the desired objective of improving the capacity of each well.
6. **Section 7.** DEQ understands that NW Natural recommends an additional Phase 1-Step 5 test that focuses on Segment 2. DEQ further understands the test will involve pumping the lower Alluvium WBZ extraction wells in the HC&C system for 7-days at a set-point of -0.15-feet; pumping the upper Alluvium WBZ extraction wells at 5-gallons per minute (gpm) except for PW-1U which will be operated at 10 gpm; and moving the control wells in Segment 2 from lower Alluvium WBZ installations to certain upper Alluvium WBZ monitoring wells. Regarding the upper Alluvium WBZ extraction wells in Segment 1, a design objective of these wells is to maintain upward vertical gradients between the upper and lower Alluvium WBZ in the portion of Segment 1 where DNAPL occurs (see data collection objective #1). Comparison of figures 3.1b and 3.2b to figures 3.1c and 3.2c indicates this objective was not achieved during the Phase 1-Step 4 test. Based on this information and prior to initiating the Phase 1-Step 5 test, DEQ requests that NW Natural clarify if and how data collection #1 is going to be further assessed. In other words, is additional testing in this portion of the HC&C system warranted during Phase 1-Step 5?...or does NW Natural believe data collection #1 has already been met? If NW Natural believes data collection #1 has been met, DEQ requests clarification on which Phase 1 test(s) achieved the objectives. DEQ also notes that some monitoring wells exhibited water levels within the range of measurement error (± 0.05 -feet) compared to the river or to other installations. These situations should be identified and discussed in the final Phase 1 report.
7. **Tables.** DEQ's comments on the report tables are provided below.
 - DEQ requests that Table 1 and Table 2 be revised to include the three DW-series installations (DW-6U, DW-11U, DW-14U).
 - DEQ understands that the PZ-9-series of piezometers are now installed. DEQ requests that tables 1 and 2 be reviewed and revised if appropriate to reflect the actual

⁴ Anchor QEA, LLC, 2012, "Revised Groundwater Source Control Construction Design Report, NW Natural Gasco Site," January (received January 31, 2012), a report prepared for NW Natural.

construction of these installations. DEQ further understands the PZ-9-series of piezometers will be instrumented for data collection during the Phase 1-Step 5 test and requests NW Natural's confirmation of this understanding.

- DEQ requests that NW Natural review and update the "Estimated Relative Efficiency" column of Table 2 based on the results of Phase 1 HC&C testing. DEQ further requests that a draft version of the updated table be provided for DEQ's review and approval prior to submittal of the final Phase 1 testing report.
- DEQ requests that the final Phase 1 testing report include a table listing the Phase 1 data collection objectives and indicating which performance monitoring installations meet the objectives and the basis for the determination. DEQ further requests that a draft version of the table be provided for DEQ's review and approval prior to submittal of the final Phase 1 testing report.

8. **Figures.** DEQ's comments on the report figures are provided below.

- DEQ requests that NW Natural review the Phase 1-Step 4 Report and add the PZ-9-series of piezometers to figures as appropriate, including but not limited to figures 1.1 through 1.5, Figure 2.1, Figure 2.2a, and Figure 2.2d.
- DEQ requests that NW Natural review the Phase 1-Step 4 Report and add the DW-series installations to figures as appropriate, including but not limited to figures 2.1, 2.2a, 2.2c, 2.2d, 2.3b, 2.5, and 2.3c.
- The label for Segment 2 shown above the geologic cross-section should be extended to the northern limit of A-A'.
- DEQ does not approve geologic cross-section F-F' (Figure 2.8b). The figure has not been revised to show DNAPL occurrence at elevation -25-feet at the GS-09 location as indicated in our January 29, 2014 (see Comment #7) and the August 9, 2012 comments letters (see DEQ's "Category 1, Comment 13, Section 2.1.4, 2nd paragraph" comment). To date, the information DEQ requested to support NW Natural's conclusion that DNAPL is not present in GS-09 at elevation -25-feet has not been provided. Until the supporting information is submitted and accepted, DEQ requires the referenced occurrence of DNAPL to be shown on the cross-section.
- Figure 2.6 (Boring B-33) and Figure 2.7 (Boring P-38) show tar penetrating through the upper Silt Unit into the upper Alluvium WBZ. These figures should be reviewed and revised. As communicated in previous correspondence, most recently in our August 9, 2012 comments to the Construction Design Report (see DEQ's comment to "Section 3.2.1.6"), DEQ considers tar to be essentially immobile given subsurface temperature conditions. Consequently, the occurrence of MGP residuals in the upper Alluvium indicates the presence of DNAPL (i.e., oil).
- References made to monitoring well MW-16-45 indicate the well screen is "saturated with LNAPL." DEQ believes the reference should be revised to indicate the installation is saturated with DNAPL.
- The key to the Figure 4-series of figures is a table that organizes control wells, observation wells, performance monitoring wells, and piezometers by groups according to hydrostratigraphic unit. DEQ requests that the key and figures be revised and organized consistent with data collection objectives for the final Phase 1 testing report. DEQ further requests that a draft version of the revised key be provided for DEQ's review and approval prior to submittal of the final Phase 1 testing report.

ATTACHMENT 2

Comments on Data Report: Groundwater Source Control Extraction System Test – Phase 1 Step 4, NW Natural GASCO Site, Portland, Oregon Dated April 10, 2014

The following are U.S. Environmental Protection Agency (EPA) comments on the document titled *Data Report: Groundwater Source Control Extraction System Test – Phase 1 Step 4* dated April 10, 2014 and prepared by Anchor QEA, LLC for NW Natural.

EPA notes that the Introduction states “As with the previous report, this Data Summary report was not intended to be an analysis of whether the HC&C system achieved hydraulic capture of groundwater.” EPA understands that the analysis of capture will be completed in subsequent reports. The reviewed document does present general conclusions regarding whether a gradient reversal was attained throughout Segments 1 and 2 in the four main designated hydrostratigraphic units: Fill, Upper Alluvium, Lower Alluvium and Deep Alluvium during the Phase 1 Step 4 Test. EPA evaluated this document based on whether the data presentation meets the stated requirements and objectives in the *Revised Groundwater Source Control Extraction System Test Plan (NW Natural, November, 2013)*. In addition, EPA evaluated the presentation of data and whether it clearly portrays the test results, or if improvements to the presentation could be made in subsequent reports.

General Comment

EPA has the following general comment related to this document.

1. As previously recommended by EPA in our General Comment 2 on the December 23, 2013 Data Report, future data summary and/or capture analysis reports should include a summary table that presents the seven objectives of data collection and provides summary statistics on the number of wells, or well pairs that meet the objective out of the number of wells, or well pairs that were used to evaluate that specific objective. Further detail, such as a list of the wells, or well pairs not meeting, or within the bounds of uncertainty for a specific objective should be provided. This would give a clear overall assessment where objectives were met and where specific improvements to the system are needed in order to meet objectives.

Specific Comments

EPA has the following specific comments related to this document.

1. Section 2, Page 3, bulleted summary of Phase Tests (Steps 1 through 4): It would benefit the summary to present the average total flow rates for each of the tests. This will provide a quantitative value that can inform multiple elements of the testing, including comparisons with previous and future

groundwater flow budgets for the site and understanding the total flow rates in relation to treatment system capacity.

2. Section 3.1, Page 5, Second Paragraph: NW Natural points out that there are insufficient data to provide potentiometric surface maps. The maps showing the data points available for the deep aquifer (Figures 3.1d, 3.2d, 3.3d, and 3.4d) highlight the deficient spatial data for the deep lower alluvium layer, particularly in Segment 2. This would also seem to impact the evaluation of capture assessment through vertical flow paths from the deep to the lower alluvium aquifer where extraction pumping occurs. EPA is concerned that there will be insufficient field data to calibrate groundwater levels modeled in the deep aquifer and verify capture assessment through supplemental field data evaluation. EPA suggests that NW Natural consider installation of additional monitoring wells completed in the deep lower alluvium within Segment 2 to obtain sufficient spatial distribution within Segment 2 for groundwater potentiometric surface contouring and vertical capture assessment.
3. Section 3.3.1, Page 7-8: There is no mention of monitoring wells that have water level differences within the bounds of the 0.05 +/- uncertainty. Well pairs with water levels within this area of uncertainty may or may not have any significance in the overall assessment of capture, but it should be clearly noted. As discussed in General Comment 1 above, the document would benefit with a summary table of test results that would show what the specified well pair was used for in the evaluation as it relates to the seven data collection objectives and if that well/or well pair demonstrated the objective, did not demonstrate the objective, or was within the bounds of measureable uncertainty.
4. Section 3.3.1, Page 8, last paragraph, last sentence: EPA understands that NW Natural plans to provide a more detailed analysis of the capture that will be provided in a future report. NW Natural should provide a preliminary reason (if possible) as to why the well pair at the upstream end of Segment 1 had a downward elevation gradient. This preliminary explanation will provide the agencies an understanding of significance for this exception and help plan for contingency measures that might be required.
5. Section 3.3.3: As pointed out in Specific Comment 3 above, there are head differences between wells and the river that are within the area of measureable uncertainty and these cases should be pointed out, preferably in a summary table. The text should include a discussion on the significance of this uncertainty as it relates to the data collection/capture evaluation objectives.
6. Section 3.3.3, last paragraph: As noted in Specific Comment 4 above, the exception presented in this paragraph should include an explanation as to why the exceptions exist at these well pair locations and their significance in relation to data evaluation objectives and help plan for possible contingency measures.

7. Section 4.1: This section references Figure 8 which provides DNAPL accumulation rates. Figure 8 should have a separate y-axis for PW-2L since its scale of DNAPL accumulation is so much larger than the other extraction wells. The current scale obscures any reviewable information for the other wells shown on the graph.
8. Section 5 and Figure 8: It is unclear if wells referred to in the text, namely DW-6U, DW-11U, and DW-14U are different, or are the same wells shown on Figure 8, yet referred to as PW-6U, PW-11U and PW-14U. Also, Figure 8 does not show some wells that are mentioned in the text as being monitored for DNAPL; these include MW-16-45 and MW-PW10L.
9. Section 6.1, Page 12: NW Natural should provide the total average yield for the Phase 1 Step 4 test in this summary section (see Specific Comment 1).
10. Section 6.2, Page 13: NW Natural should provide the rationale for making the temporary changes to the system for the interim testing and provide the total average flow rate during the interim testing period.
11. Section 6.2, Page 13: NW Natural should provide verification that the upper alluvium wells are sustainable at a constant flow control rate of 5 gallons per minute (gpm).
12. Section 7: As noted in Specific Comment 11 above, NW Natural should verify that the Upper Alluvium extraction well PW-1U flow rate of 10 gpm is sustainable, along with the other Upper Alluvium wells, at their planned constant rate flow control settings. NW Natural should also be aware that constant rate flow control settings may impact treatment operation and maintenance schedules due to the increased flow volumes.